People Prepared for

Emerging Health Threats

Public health preparedness for emerging health threats in 2006 encompassed a very wide array of activities for NCIRD. From rapid identification and response to outbreaks, to pandemic planning activities, to laboratory research identifying emerging pathogens tracked by ongoing top-notch surveillance systems, NCIRD continues to identify and address urgent clusters of disease while planning for future outbreaks.

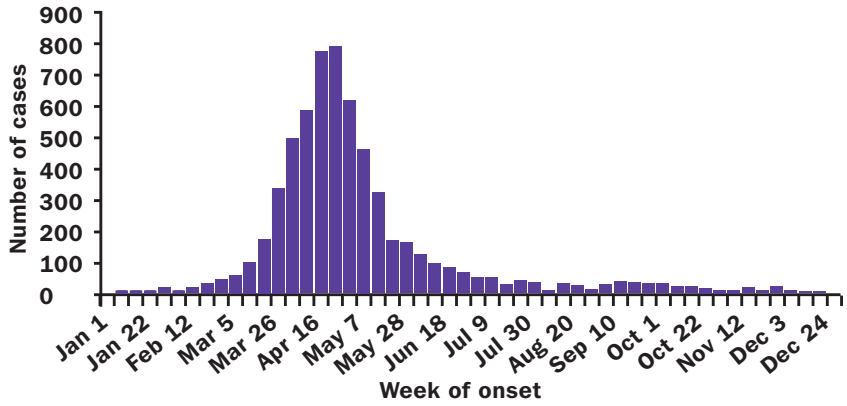
Coordinating a national response to a mumps outbreak—

college campus clusters!

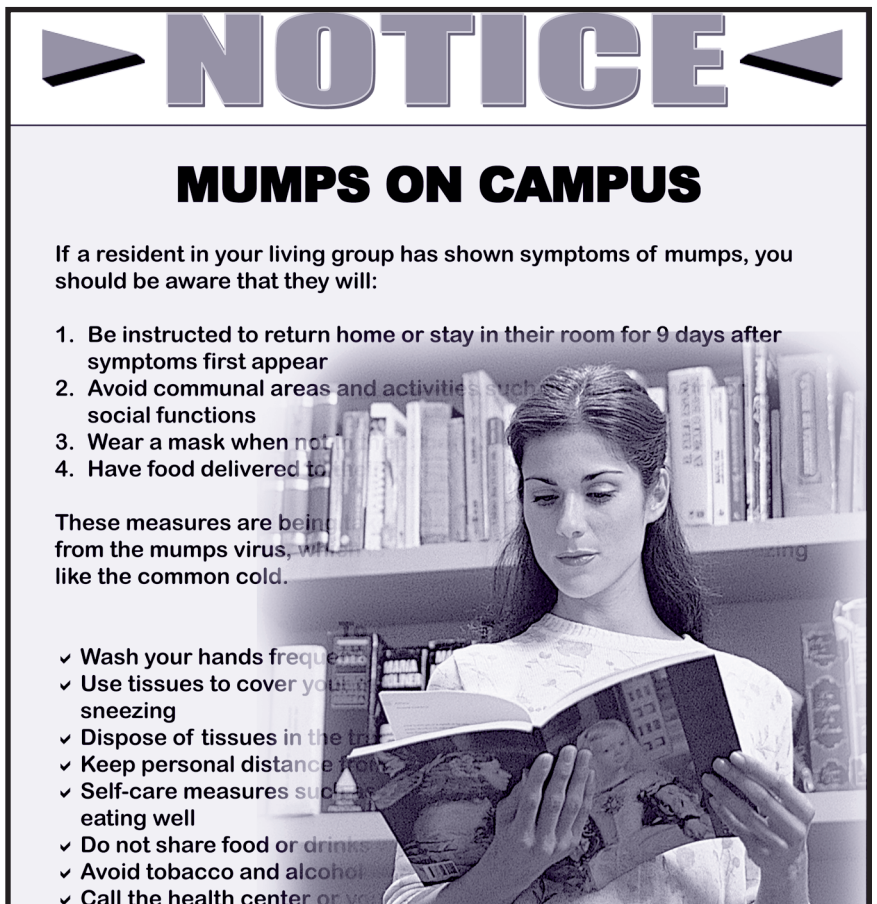
IN 2006, A LARGE MUMPS OUTBREAK occurred in the US, with over 5,000 reported cases. The outbreak began in Iowa in December 2005, peaked in the second half of April 2006, and declined to low levels of reporting over the summer months. As colleges resumed classes for the fall, a few campuses reported short-lived clusters of mumps. 84% of the cases occurred in Iowa and five nearby states. The age group most affected in the outbreak was young adults 18–24 years of age, and many outbreaks were reported at college campuses. Females disproportionately bore 63% of the burden. In Iowa, vaccination status was known for 70% of the patients, and of these, 49% had received at least two doses of the measles, mumps, and rubella (MMR) vaccine.

The age group most affected in the outbreak was young adults 18–24 years of age, and many outbreaks were reported at college campuses

Mumps Cases, United States, January 1 – December 31, 2006 (n=6330)



Source: National Notifiable Diseases Surveillance System



CDC/NCIRD coordinated the national response to the mumps outbreak through the following efforts:

- tracking reported cases from throughout the country;
- providing technical support in epidemiology, public health, and laboratory issues to state health departments and laboratories;
- assessing the risk of transmission during air travel;
- providing laboratory diagnostic services;
- revising national vaccine policy;
- providing new and updated documents on the CDC website;
- creating updates via TV, print, and radio media outlets;
- coordinating conference calls with all involved states; and,
- initiating collaborative studies with state health departments and laboratories to investigate the cause of the outbreak (especially vaccine effectiveness), and to improve diagnostic laboratory testing.

In response to the outbreak of mumps, the Advisory Committee on Immunization Practices (ACIP) updated its recommendation for acceptable evidence of mumps immunity and vaccination: one dose of live mumps vaccine for preschool-aged children and adults not at high risk, and two doses of live mumps vaccine for school-aged children (*i.e.*, grades K–12) and for adults at high risk (*e.g.*, healthcare workers, international travelers, and students at post-high school education institutions).

Meningitis outbreak control and prevention measures

in a hard-to-reach community in Brooklyn, NY

ON FEBRUARY 15, 2006, CDC WAS notified by the New York City Department of Health and Mental Hygiene (NYC DOHMH) of a cluster of *Neisseria meningitidis* serogroup C cases from the borough of Brooklyn in New York City. Through September 2006, 28 cases of serogroup C meningococcal disease were identified in and around the Bedford-Stuyvesant section of Brooklyn. Preliminary case interviews suggested a common theme of connection to the street drug-using community.

Nine of the 28 cases occurred among persons who reported using street drugs (cocaine, crack, and heroin) and/or were on methadone maintenance therapy, and nine cases involved close household contacts of street drug users. The expected

Preliminary case interviews suggested a common theme of connection to the street drug-using community

number of serogroup C meningococcal cases in the borough of Brooklyn is approximately three per year. Although the absolute number of street drug users in this area is not known, this rate of three per year likely represents a higher than expected rate of invasive meningococcal disease, compared to the background rate of 0.5 to 1.5 cases per 100,000 population per year in New York City and in the US.

The target population for vaccination included individuals 18 years and older who had used cocaine, crack, heroin, or methadone in the preceding three months, and either resided in or used drugs in the Brooklyn zip codes

The DOHMH implemented a targeted vaccination campaign directed toward drug users and their household contacts, hoping to interrupt the transmission of *Neisseria meningitidis* and to control the outbreak. The target population for vaccination included individuals 18 years and older who had used cocaine, crack, heroin, or methadone in the preceding three months, and either resided in or used drugs in the Brooklyn zip codes. Vaccine was distributed at methadone clinics (MMTPs), syringe exchange programs (SEPs), day and residential drug treatment facilities, soup kitchens, and several clinical sites in these areas. Close personal contacts of drug users (either residing with or having intimate oral contact, defined as kissing with an open mouth) were also eligible to receive vaccine at these same locations.

Together with CDC, the DOHMH conducted an oropharyngeal carriage study in an attempt to further characterize the serogroup C outbreak strain and to assess the effectiveness of the vaccination campaign in reducing oropharyngeal carriage of *Neisseria meningitidis* serogroups contained in the new meningococcal protein conjugate vaccine. The carriage study was conducted at DOHMH vaccination campaign sites serving the targeted Brooklyn drug-affected population.

Brooklyn Bridge photo courtesy of www.endex.com

ABCs
in 2006

ACTIVE BACTERIAL CORE SURVEILLANCE (ABCs) of the Emerging Infections Program (EIP) Network is an active, population- and laboratory-based surveillance for invasive bacterial infections among 39 million persons in ten US sites. It has been ongoing for 11 years.

ABCs tracks select culture-confirmed, invasive bacterial diseases. Built on a collaborative effort among CDC, state and local health departments, and academic partners, ABCs has longitudinal,

ABCs is also an established public health network that can be part of a response to emerging health threats

multi-site data for over ten years from multiple sites. ABCs population-based data collected through active surveillance allow CDC to generate age- and race-specific rates of disease and to monitor trends in disease over time. In addition to routine surveillance, the ABCs infrastructure serves as an excellent platform for a variety of special studies, including evaluation of the impact of vaccines and other public health interventions. ABCs is also an established public health network that can be part of a response to emerging health threats.

The ABCs system conducts surveillance for invasive infections caused by six bacterial pathogens: *Neisseria meningitidis*, *Haemophilus influenzae*, *Streptococcus pneumoniae*, groups A and B streptococcus, and methicillin-resistant *Staphylococcus aureus* (MRSA). Although ABCs surveillance varies by pathogen, it is conducted in ten states—CA, CO, CT, GA, MD, MN, NM, NY, OR, and TN—with a total population ranging between 15 to 39 million under surveillance.

Highlights in 2006

- A multi-site study of the post-licensure impact of pneumococcal conjugate vaccine demonstrated vaccine effectiveness among young children using a variety of different schedules **and** among children who had not received all of the recommended doses.
- ABCs also showed that the pneumococcal conjugate vaccine significantly reduced the rate of infection from drug-resistant *Streptococcus pneumoniae* in both the vaccinated population **and** in the community.
- ABCs continues to track changes in pneumococcal disease caused by non-vaccine strains to determine what serotypes will be included in new vaccine formulations.
- ABCs sites are currently participating in two important post-licensure studies of the meningococcal conjugate vaccine.
- Ongoing research in the prevention of perinatal sepsis continued in 2006, including a review of over 6000 labor and delivery records in ten states to evaluate implementation of perinatal infection prevention guidelines.
- ABCs continued ongoing surveillance for invasive community-acquired MRSA (methicillin-resistant *S. aureus*) in nine sites; **newly emerged MRSA strains originating in the community setting have now moved into healthcare settings**, increasing the burden of MRSA disease in the US overall.

ABCs 2006 Surveillance Officers Meeting.

Active Bacterial Core surveillance

ABCs tracks invasive infections from these pathogens:
Neisseria meningitidis
Haemophilus influenzae
Streptococcus pneumoniae
groups A and B streptococcus
methicillin-resistant *Staphylococcus aureus* (MRSA)

As of 2006, ABCs is conducted in selected areas of:	
California	Minnesota
Colorado	New Mexico
Connecticut	New York
Georgia	Oregon
Maryland	Tennessee

Domestic and international training helps

prepare for avian influenza

WHILE REPORTS OF ANIMAL AND human cases of avian influenza A (H5N1) continue to make headlines around the world, CDC's Influenza Division is working to provide hands-on training sessions about avian and pandemic influenza. In the US, three epidemiology capacity training sessions were held in Atlanta. One of these training sessions was held in collaboration with the Council of State and Territorial Epidemiologists and strengthens the partnership with state epidemiologists.

Internationally, the Influenza Division provided educational materials and training to educate others about avian and pandemic influenza. More than 100 participants from 14 countries attended the first international rapid response training for avian and pandemic influenza in Bangkok, Thailand in July 2006. During the workshop, participants received hands-on training in response methods geared toward the first 72 hours following reports of a respiratory outbreak in humans.

NCIRD also recently helped design training sessions and provide supplies and staff members for three additional avian influenza trainings in Thailand, and one in Brazil as part of CDC's ongoing effort to enhance international capacity to detect avian influenza. Additionally, the Influenza Division worked with other CDC staff to train more than 40 laboratory technicians and public health staff from 13 African nations.

Diane Gross, DVM, PhD, went to Southern Sudan in September, 2006, to participate in an outbreak investigation of avian influenza A (H5N1) in birds in the area. Working with CDC Kenya, Gross assisted in determining the extent of the outbreak in chickens in Juba, conducting active surveillance for humans, setting up training at hospitals, and preparing equipment and isolation procedures. Gross worked on administering a survey to about 1,500 households during a four-day period. The survey was conducted door-to-door as a way to check for cases of bird deaths and suspected cases of avian influenza in humans. In an effort to inform the people of Sudan about the outbreaks in chicken, Gross was involved in setting up radio messages, as well as coordinating a yellow taxi cab to drive throughout Juba broadcasting messages about avian influenza. "We found this to be an effective use of local communication techniques," says Gross. "We even had one lady who had been sick and had experienced bird die-offs in her house come to the hospital because she had heard the radio messages."

Photo courtesy of Diane Gross

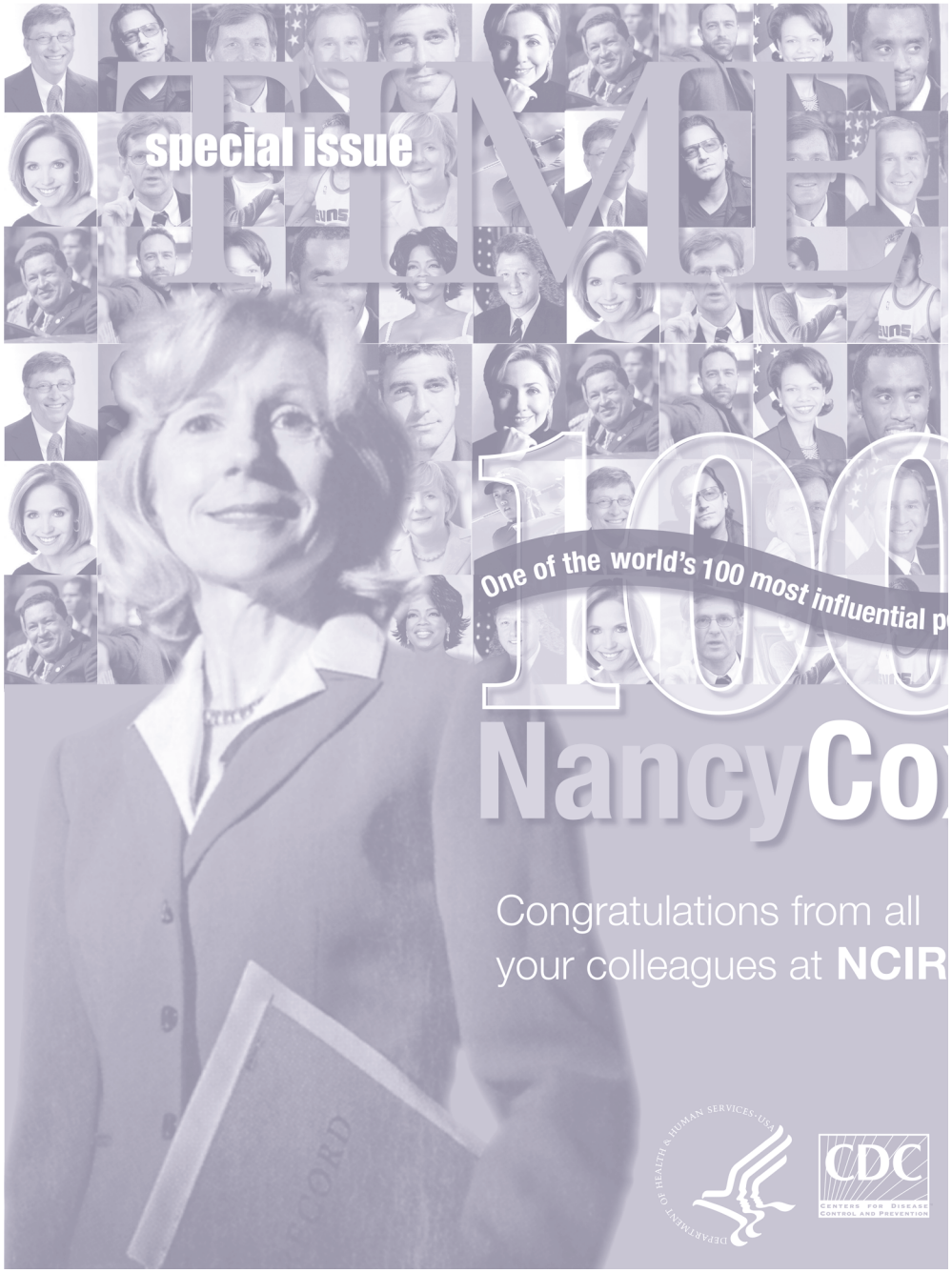
TAXI IN USE
Broadcasting avian influenza messages through loudspeakers was an effective local communication technique.

Dr. Nancy Cox

2006 Federal Employee of the Year

Nancy J. Cox, PhD, Director of the Influenza Division, National Center for Immunization and Respiratory Diseases (NCIRD), was cited in 2006 by two national news magazines for her role in heading up CDC research into the avian flu virus and pandemic prevention. Both *TIME Magazine* and *Newsweek* carried articles describing Cox's important work at CDC and its repercussions worldwide. In addition, Dr. Cox was honored in 2006 with a **Service to America Medal**—a prestigious national award that recognized her as the Federal Employee of the Year.

Dr. Cox is also the Director of the World Health Organization (WHO) Collaborating Center for Influenza. She is a world-renowned leader in her field and has made countless contributions to global influenza knowledge, prevention and control. Her colleagues describe her as a "visionary" and a "unique contributor to science and public health."



Learn from the past

to prepare for the future

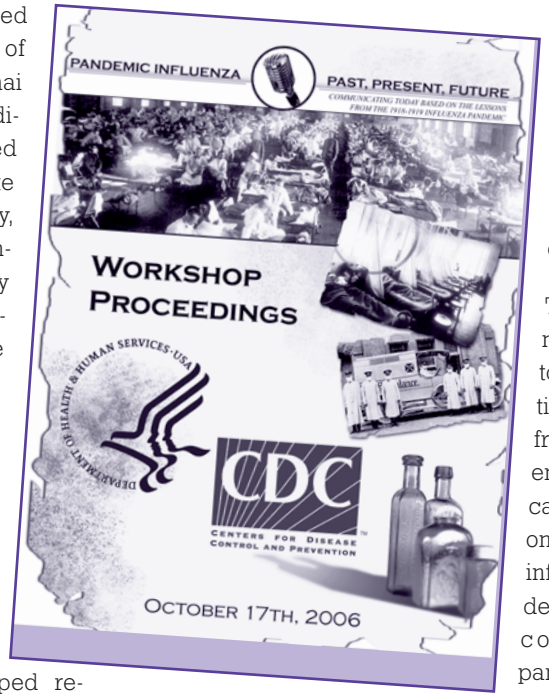
Reconstruction of the 1918 Spanish Influenza pandemic virus

In an effort to better understand pandemic influenza, scientists at CDC were able to reconstruct a virus matching all eight gene segments of the influenza virus responsible for the 1918 pandemic. This strain of influenza caused the deaths of an estimated 50 million people worldwide between 1918 and 1919, including an estimated 675,000 people in the US. A unique feature of the 1918 pandemic was the unusually high death rate it caused among healthy adults 15 to 34 years old. In contrast, most seasonal influenza viruses cause greater complications in the young and the elderly. The 1918 pandemic virus was so virulent and deadly among healthy adults that it **lowered the average life expectancy in the US at that time by more than 10 years**.

This strain of influenza caused the deaths of an estimated 50 million people worldwide between 1918 and 1919

CDC sought to reconstruct the virus in order to study the cause of its lethality and to determine the characteristics that allowed it to emerge as a pandemic. Reconstructing the long-dead virus proved challenging for researchers, but a breakthrough discovery made the task possible.

Researchers were able to exhume the frozen body of an Alaskan influenza victim, who had been buried and preserved in permafrost since 1918. Work on the project involved cooperation of the Mount Sinai School of Medicine, the Armed Forces Institute of Pathology, and the Southeast Poultry Research Laboratory. Once the 1918 virus was reconstructed, it was handled in highly secure bio-security level 3 laboratories. Analysis of the virus helped researchers determine which genes were responsible for making it so dangerous—an important step in developing new drugs and vaccines for pandemic influenza.



A historical review of the impact of the 1918–1919 influenza pandemic

On October 17, 2006, the US Department of Health and Human Services (HHS) and CDC/NCIRD presented a historical retrospective review of the impact of the 1918–1919 influenza pandemic. A panel of experts convened to discuss how the 1918–1919 pandemic affected daily life in the US, and what lessons could be learned and applied to planning today.

The goals of the meeting were to provide participants with a frame of reference and historical background on the 1918–1919 influenza pandemic, identify contemporary pandemic influenza issues and questions, and present guidance for the development of communication materials and messages to be used in the event of an influenza pandemic.

During the day-long meeting, renowned experts and historians provided historical perspectives and reviewed literature and "fugitive data" (data that are not commonly cited). They also analyzed themes and issues that arose during the 1918–1919 influenza pandemic that are relevant to current pandemic communication planning efforts.

The themes and issues covered fell under three broad questions:

1. How did the 1918–1919 influenza pandemic affect family life?
2. How did the 1918–1919 influenza pandemic affect local communities?
3. How did the government respond, and how did society adjust to disruptions caused by the pandemic?

Workshop participants were federal, state, and local public health personnel. They discussed the presentations made by the expert panel and generated questions they thought likely to be asked by the public during an influenza pandemic.

Pandemic influenza

raising public awareness

A SERIES OF QUESTIONS THAT WERE frequently asked by news reporters about pandemic influenza became the core set of pandemic issues and concerns that were used in the development of a series of talking points for pandemic preparation. An expert panel of influenza subject matter experts, health communication specialists, and public health policy experts convened for several months in early 2006, and under the direction of internationally recognized risk communication expert Vincent Covello, PhD, over 60 message maps were produced. These message maps contained key talking points for public health and medical officials to answer pandemic related questions. The message maps for pandemic preparation have been distributed to local, state, and other federal public health agencies and are available on the US Government's pandemic influenza website at www.pandemicflu.gov.

...but are the messages heard loud and clear?

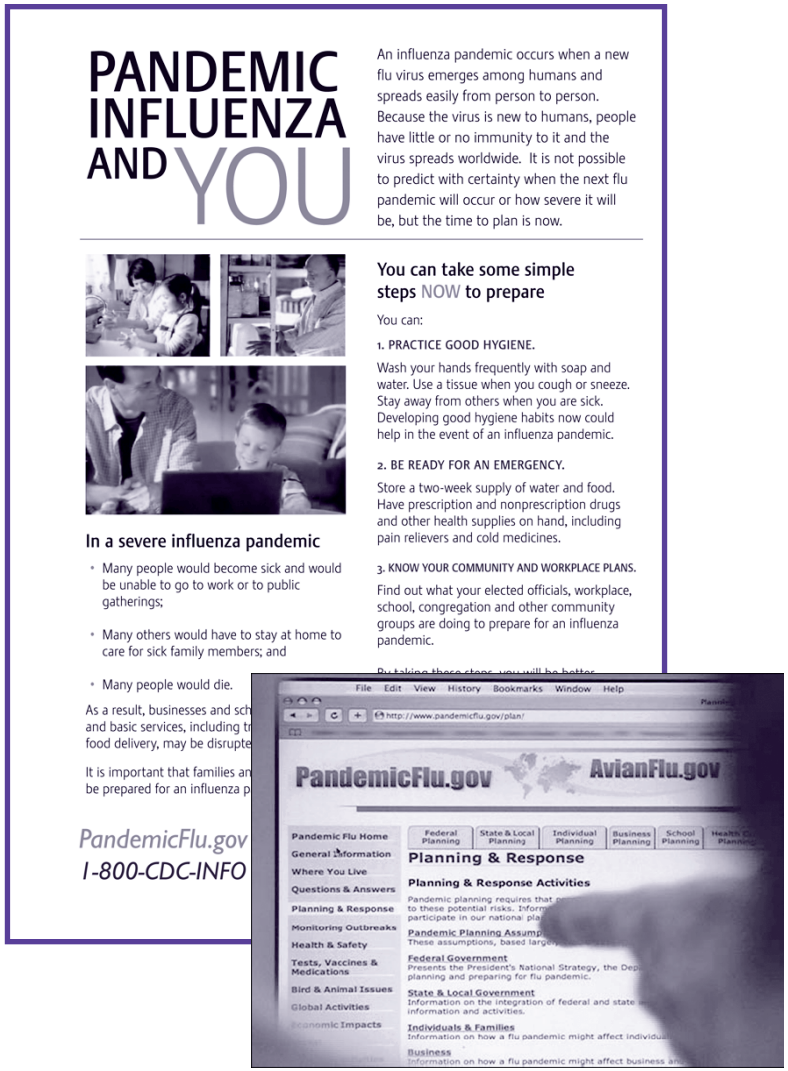
Qualitative assessment of pandemic influenza issues

The extensive news coverage and the creation of new draft pandemic messages created a need for an assessment of the public's perception of pandemic influenza issues and an evaluation of new pandemic communication products. In August, 2006, NCIRD, in collaboration with the Office of the Assistant Secretary for Public Affairs, Office of the Secretary, Department of Health and Human Services, and the Oak Ridge Institute for Science and Education conducted an investigation to:

- assess perceptions of preferred strategies regarding a vaccine for human pandemic influenza;
- assess knowledge attitudes, and beliefs regarding bird flu and pandemic influenza;
- investigate factors that increase or decrease the likelihood of people taking actions to prepare for pandemic influenza; and
- test draft communication materials. 144 respondents participated in a total of 32 focus groups.

Additional findings of this study revealed that while awareness of bird flu was high, knowledge of bird flu remains limited

Participants were screened to provide representation by gender, age, education, income, and race/ethnicity. Equal numbers of groups were conducted in San Francisco, CA, and Dallas, TX. Approximately half of the participants were "doers"—those who reported that they had either taken at least one specific action to prepare for bird flu or pandemic influenza in the US, or were likely to do so in the near future. The remainders were "non-doers." Additional findings of this study revealed that while **awareness** of bird flu was high, **knowledge** of bird flu remains limited.

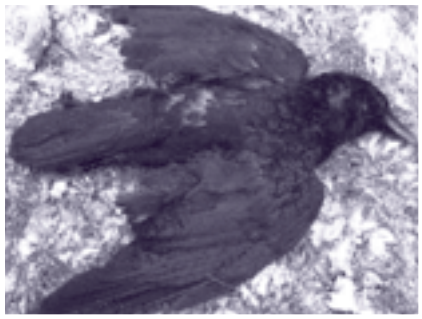


Practical pandemic resources—

guidance on safe handling of dead birds for the public and guidelines for poultry workers

AVIAN INFLUENZA A (H5N1) AND WEST Nile Virus (WNV) are emergent health threats that require active surveillance and control. WNV has already affected most of the US, and H5N1 is being watched very closely for its potential to begin a human influenza pandemic. **Both viruses share a common trait: they are carried by birds.** Surveillance of dead birds by state health departments has proven useful for early detection of WNV in the US and H5N1 in Europe.

In 2006, NCIRD played a key role in establishing joint guidelines for coordinated surveillance for WNV and avian influenza in the US. In addition, NCIRD developed guidance on how to safely handle dead birds for those people conducting surveillance and testing. By combining surveillance for both viruses among dead birds in the US, CDC and its partners have strengthened the capacity for this surveillance to act as an early warning system. By providing clear guidelines for handling dead birds safely, the health of state workers and others involved in this important surveillance activity has been protected.



GOAL: NEVERMORE
West Nile and H5N1 can be carried by birds.

To protect poultry workers in the US from avian influenza exposure, NCIRD helped establish and update workplace safety measures for the poultry industry

NCIRD, working in partnership with the US Department of Agriculture, the US Department of Labor, and others has identified certain professions and work environments that pose a more likely risk for exposure to potentially dangerous influenza viruses, such as H5N1. Poultry workers are a risk group for avian influenza because their work environments may involve close contact with birds or bird fluids and feces —all of which can contain avian influenza viruses. To protect poultry workers in the US from avian influenza exposure, NCIRD helped establish and update workplace safety measures for the poultry industry.

Through collaborative efforts, these safety measures have provided poultry workers with critical information regarding proper use of safety equipment, including guidelines for use of respirators, face shields, and gloves. These educational materials have helped protect poultry workers and their flocks from the dangers of H5N1. In addition, NCIRD has developed more general educational materials for the public if there were to be an H5N1 outbreak in the US, including guidance on how to safely handle and cook poultry.

SAFETY ON THE JOB
Poultry workers can be at-risk for avian influenza.

Photo courtesy of Georgia Institute of Technology

Rapid response tests

for emerging influenza viruses aid pandemic planning

In 2006, CDC announced $11.4 million in new contracts to four companies working to develop low-cost diagnostic tests for avian influenza. Doctors and field epidemiologists could eventually use these tests on-site to quickly and accurately test patients for avian influenza A (H5N1) and other emerging influenza viruses.

The selected companies will work to create tests that will detect seasonal human influenza viruses and **differentiate avian influenza A (H5N1) from seasonal human influenza viruses within 30 minutes**. Currently, the process for testing for avian influenza A (H5N1) takes between four and 24 hours to complete and requires laboratories with specialized capabilities. Of the few avian influenza viruses that have crossed the species barrier to infect humans, avian influenza A (H5N1) has caused the largest number of detected cases of severe disease and death in humans. Each additional human case gives the virus an opportunity to change and improve its transmissibility in humans, and thus develop into a pandemic strain.

Rapid diagnostic tests for influenza virus infection can be used at the site of patient care to help in the diagnosis and management of patients who present with signs and symptoms compatible with influenza. The diagnostic tests could eventually be able to test patients for emerging influenza viruses, in addition to avian influenza A (H5N1).

During outbreaks, it will be especially important for doctors to be able to quickly and easily distinguish at a patient's bedside whether they suffer from avian influenza A (H5N1) or a more common type of influenza. The new diagnostic tests will also allow doctors to treat patients faster and help public health authorities track influenza viruses that could spur a pandemic. Rapid diagnosis will provide critical, timely information needed to implement measures to prevent further spread of novel influenza viruses and to alert close contacts of sick people.

If the virus mutates over time, or if new viruses emerge that have the potential to cause an influenza pandemic, the tests would also need to be quickly adapted. By providing funding now, CDC hopes to reduce the chance that a mutation will render multiple tests useless in the future. Additionally, the funding is aimed to advance work that will yield one or more approved tests within two to three years.

Each additional human case gives the virus an opportunity to change and improve its transmissibility in humans, and thus develop into a pandemic strain.

HARD AT WORK
Dr. Terrence Tumpey in the influenza laboratory.

The new diagnostic tests will also allow doctors to treat patients faster and help public health authorities track influenza viruses that could spur a pandemic.

Better diagnostic tests
the key to preparedness

Pertussis outbreak or not?

NCIRD's Meningitis and Vaccine Preventable Diseases Branch (MVPDB) investigated two healthcare worker respiratory illness outbreaks that were initially believed to be pertussis. While the hospitals implemented control measures, including antibiotic prophylaxis, vaccination campaigns, and extensive testing, MVPDB began their investigation. Using additional epidemiologic and laboratory data, they were able to determine that pertussis was not the cause.

These outbreaks highlight the importance of having better diagnostic tests that health departments can use early in an investigation to determine if an outbreak is pertussis.

MVPDB is initiating an important validation study to evaluate the clinical sensitivity and specificity, as well as the clinical usefulness (as related to stage of disease, age, antibiotic use, and vaccination status) of newly developed in vitro diagnostics for pertussis.

Using additional epidemiologic and laboratory data, they were able to determine that pertussis was not the cause

If successful, the results from this study will ensure that validated laboratory assays are available to: assess and manage pertussis cases and outbreaks; measure the real burden of adolescent and adult pertussis disease; and, perform future pertussis vaccine efficacy studies.

Improved lab tests help track norovirus "stomach flu" on land and at sea

For more than ten years, CDC has developed more sensitive and rapid tests to diagnose norovirus illness and has transferred this technology to state public health departments. This has led to a dramatic increase in the recognition of the burden from this illness. In 1994, nine foodborne outbreaks were confirmed as caused by norovirus by CDC.

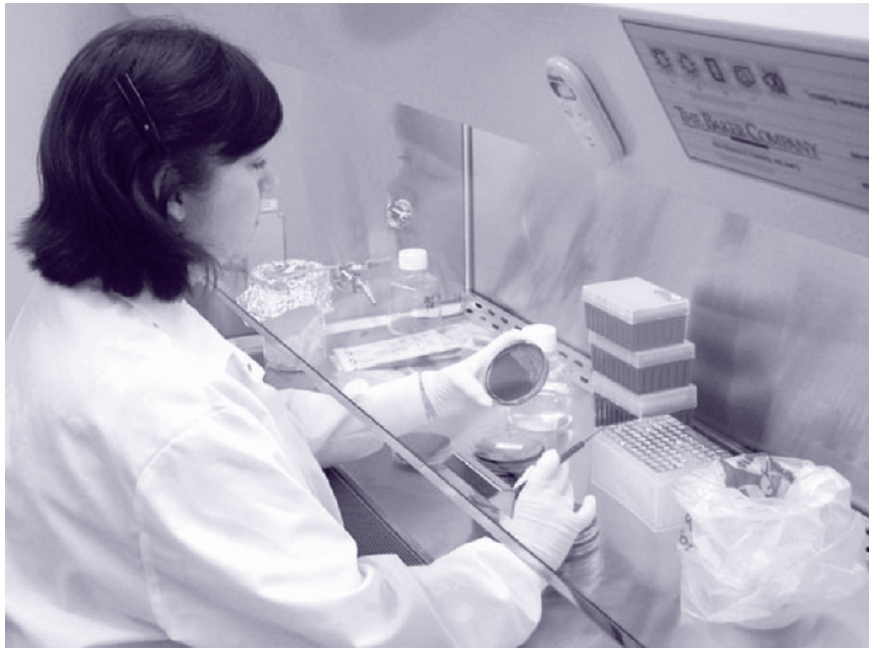
In 2004, the most recent year that data are available, 247 norovirus outbreaks were confirmed by 37 states. In 2006, almost every US state has the capacity to test for norovirus. Norovirus is now estimated to cause 30–50% of all foodborne outbreaks. Appreciation of this disease burden has prompted the FDA to make specific changes to its guidelines for safe food preparation (the Food Code) to help prevent foodborne norovirus infection.

Norovirus is now estimated to cause 30–50% of all foodborne outbreaks

Outbreaks occur more often where there are more people in a small area, such as nursing homes, restaurants, catered events, and cruise ships. Health officials track illness on cruise ships. **Therefore, outbreaks are found and reported more quickly on a cruise ship than on land.**

Close living quarters may increase the amount of group contact, and new passenger arrivals may bring the virus to other passengers and crew. NCIRD provided technical and laboratory assistance for cruise ship norovirus outbreaks in 2006.

PURSUING PERTUSSIS
Pam Cassiday, MS, Pertussis and Diphtheria laboratory



NCIRD laboratories—*new* diagnostics methods technology

NCIRD laboratory aids development of new pneumonia diagnostics

What would aid laboratories in running tests quickly and efficiently during potential outbreak situations? Faster and easier lab tests that can look for multiple pathogens—and detect them from a single patient specimen. In partnership with CDC, a commercial laboratory modified its assay to use CDC-designed targets for bacterial and viral respiratory pathogens.

NCIRD is assisting in the design and evaluation of a low-density array card assay that allows 398 simultaneous testing reactions to occur within four hours

This project resulted in two separate assays, one for RNA viruses, and one for bacterial DNA. CDC's NCIRD Bacterial Respiratory Diseases Lab evaluated the analytical sensitivity and specificity of the bacterial assay and tested a number of clinical specimens from the respiratory disease surveillance project at the Thailand IEIP site. Results from the developmental assay were compared to the CDC real-time assays and analyzed.

In collaboration with multiple partners, NCIRD is assisting in the design and evaluation of a low-density array card assay that allows 398 **simultaneous** testing reactions to occur within four hours. The test uses CDC-designed targets for bacterial and viral respiratory pathogens.

This developmental assay can be used to quickly determine the cause of outbreaks of pneumonia and influenza-like illness, and to conduct surveillance for respiratory disease. CDC is also involved in the design of the next generation of tests, which can be deployed in the field and test a specimen for ten pathogens per run—quickly aiding epidemiologic investigations in 'real time' when the source of an outbreak is unknown.

NCIRD "Strep Lab" helps track emerging pathogens

The CDC Streptococcus Laboratory performs surveillance for important serotypes, antibiotic resistance traits, and clonal types of streptococcal pathogens. During the past year, the laboratory characterized the detailed clonal structure of current strains comprising a *Streptococcus pneumoniae* serotype (19A) that is **not** targeted by current vaccines; however, it has become the predominant invasive serotype. In addition, research revealed several newly-emerged type 19A strains, including some strains that have "switched" from vaccine-targeted serotypes to 19A.

2006 also brought innovative, surveillance-based research that included the discovery of a new resistance determinant in group A streptococci.

The laboratory has developed molecular methods that allow other laboratories to perform meaningful streptococcal serotype surveillance. Since current vaccines and vaccines in development for pathogenic streptococci are based upon capsular and protein serotypes, the lab's serotype surveillance continues to be a global resource.

EMERGING STREP STRAIN? Alma "Ruth" Franklin in the Streptococcus Biological Science Lab.

New anthrax technology could be key to successful intervention and treatment

In a cross-center collaboration with the National Center for Environmental Health (NCEH), NCIRD laboratories are working on a promising anthrax early detection test. Using a mass spectrometry cleavage assay technique, this anthrax 'test' uses the measurement of anthrax toxin in the body as both a diagnostic tool and a marker for the efficacy of therapeutic intervention.

By using a parallel track method—detecting both the presence of circulating toxin **and** circulating antibodies in the body—scientists can show in a quantitative way both the patient's immune response after the initial exposure to anthrax, as well as the patient's response to antibiotic and antitoxin (IG) treatment.

NCIRD laboratories are working on a promising anthrax early detection test

From a medical and public health perspective, detecting anthrax as early as possible offers improved diagnosis and treatment. In 2006, CDC scientists were able to prove for the **first time** in the field that the first-line treatment of antibiotics actually works to speed the clearing of the toxin from the body, **treating not only the bacteremia**, but also the toxemia. Being able to more fully understand the function of antibiotic treatment and quantify the body's response enables scientists to better prepare for, understand, and successfully treat anthrax exposure.

Appendix

Who's who in NCIRD

Center leadership

A

James Alexander*
Chief
Epidemiology Branch
DVD

Larry Anderson
Director
DVD

B

Beth Bell
Associate Director for Epidemiologic Science, NCIRD

Bill Bellini
Chief
MMR and Herpes Branch, DVD

Joe Bresee
Chief, Epidemiology and Prevention Branch
ID

Carolyn Bridges
Associate Director for Science
ID

Brent Burkholder
Director
GID

C

Lisa Cairns*
Associate Director for Science
GID

Nancy Cox
Director
ID

D

Michael Detmer
Associate Director for Management and Operations, NCIRD

Vance Dietz
Chief
Global Measles Branch
GID

Ruben Donis
Chief
Molecular Virology and Vaccines Branch, ID

F

Nancy Fasano
Chief
Program Operations Branch, ISD

Barry Fields*
Associate Director for Laboratory Science
DVD

Kim Fears
Program Management Officer
GID

G

Jon Gentsch*
Chief, Gastroenteritis and Respiratory Viruses Branch, DVD

Sue Goldstein*
Associate Director for Science
DVD

Tammy Gorny
Program Management Officer
ID

J

Dan Jernigan
Deputy Director
ID

Denise Johnson*
Chief
Polio Eradication Branch, GID

K

Jacqueline Katz
Chief, Immunology and Pathogenesis Branch
ID

Bob Keegan
Deputy Director
GID

Vanda Kelley
Associate Director for Policy
ISD

Olen Kew
Associate Director for Global Laboratory Science, NCIRD

Alexander Klimov
Chief
Virus Surveillance and Diagnosis Branch, ID

L

Derrick Lake*
Program Management Officer
DBD

M

Karen Mason*
Associate Director for Health Policy
NCIRD

Alison Mawle*
Director
DBD

Nancy Messonnier
Chief, Meningitis and Vaccine Preventable Diseases Branch, DBD

Ann Moen
Associate Director for Extramural Programs
ID

Gina Mootrey
Associate Director for Adult Immunization
ISD

Trudy Murphy*
Associate Director for Science
DBD

O

Steve Oberste*
Associate Director for Laboratory Science
DVD

P

Mark Pallansch
Chief, Polio and Picornaviruses Laboratory Branch, DVD

Larry Pickering
Executive Secretariat, ACIP
NCIRD

R

Lance Rodewald
Director
ISD

S

Jeanne Santoli
Associate Director
ISD

Anne Schuchat
Director
NCIRD

Jane Seward*
Deputy Director
DVD

Michael Shaw
Associate Director for Laboratory Science
ID

Abigail Shefer
Associate Director for Science
ISD

Jim Singleton
Chief
Assessment Branch
ISD

Julie Smith*
Program Management Officer
ISD

T

Charlis Thompson*
Associate Director for Communications
NCIRD

Kathy Towers-Solis
Chief, Education, Information and Partnership Branch, ISD

U

Gary Urquhart
Chief, Immunization Information Systems Support Branch, ISD

W

Greg Wallace
Chief
Vaccine Supply and Assurance Branch, ISD

Melinda Wharton
Deputy Director
NCIRD

Cindy Whitney
Chief
Respiratory Diseases Branch, DBD

Pascale Wortley
Chief, Health Services Research and Evaluation Branch, ISD

Legend

DBD	**Division of Bacterial Diseases**
DVD	**Division of Viral Diseases**
GID	**Global Immunization Division**
ID	**Influenza Division**
ISD	**Immunization Services Division**
NCIRD	**National Center for Immunization and Respiratory Diseases**

***Acting**

Calendar of events 2007

Epidemiology and Prevention of Vaccine-Preventable Diseases 2007—Four-Session Series
January 25, February 1, 8, and 15, 2007,
12:00 Noon – 4:00 PM ET
A National Center for Immunization and Respiratory Diseases and the Public Health Training Network Satellite Broadcast & Webcast
www2.cdc.gov/phtn/epv07/default.asp

National Vaccine Advisory Committee (NVAC) Meeting
February 5–6, 2007
Washington, D.C.
Call Emma English at 202-260-1253
www.hhs.gov/nvpo/nvac

Infectious Disease Society of America—2007 Clinical Practice Meeting
February 16–17, 2007
The Renaissance Vinoy Resort & Golf Club,
St. Petersburg, FL
www.idsociety.org/

American College of Preventive Medicine (ACPM)—Preventive Medicine, 2007
February 21–24, 2007
Miami, FL
www.preventivemedicine2007.org/reg.htm

Advisory Committee on Immunization Practices
February 21–22, 2007
Atlanta, GA
www.cdc.gov/nip/ACIP/

International Meeting on Emerging Diseases and Surveillance (IMED 2007)
February 23–25, 2007
Vienna, Austria
http://imed.isid.org/

FDA's Vaccines and Related Biologicals Advisory Committee (VRBAC)
February 27–28, 2007
Bethesda, MD

41st National Immunization Conference
March 5–8, 2007
Kansas City, MO
www.cdc.gov/nip/nic

January

S	M	T	W	T	F	S
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7	8	9	10	11	12	13
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28	29	30	31			

February

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25	26	**27**	**28**			

March

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April

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	22	**23**	**24**	**25**	**26**	**27**	**28**
	29	**30**					

May

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27	**28**	**29**	**30**	**31**		

June

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10	11	12	13	14	15	16
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24	25	26	**27**	**28**	**29**	**30**

57th National Medical Association (NMA) Convention—Health Care Justice: Pursuing the Dream of a Healthy Society
March 7–11, 2007
Hyatt Regency Crystal City, Arlington, VA / Washington, DC
www.amsa.org/conv/convprogram.cfx?who=Advocacy

6th Annual Forum for Improving Children's Health Care—Taking Flight: Achieving Excellence in Health Care for All Children
March 19–21, 2007
Hyatt Regency San Francisco, San Francisco, CA
www.nichq.org/nichq

World Vaccine Congress Washington 2007
March 19–22, 2007
Four Seasons Hotel, Washington DC
www.terrapinn.com/2007/wvc_DC

24th Annual Behavioral Risk Factor Surveillance System Conference—"BRFSS: Promoting Healthier, Safer People"
March 24–28, 2007
Holiday Inn Decatur, Decatur, GA
www.cdc.gov/brfss/conference/index.htm

8th European Meeting on the Molecular Biology of Pneumococcus
April 14–17, 2007
Oeiras, Portugal
www.itqb.unl.pt/Scientific_Events/Meetings

56th Annual Epidemic Intelligence Service (EIS) Conference
April 16–20, 2007
The Sheraton Midtown Atlanta Hotel at Colony Square
Atlanta, GA
www.cdc.gov/eis/conference/conference.htm

National Influenza Vaccine Summit Meeting 2007
April 19–20, 2007
JW Marriott Buckhead,
Atlanta, GA
www.ama-assn.org

National Infant Immunization Week (NIIW) Vaccination Week in the Americas (VWA)
April 21–28, 2007
www.cdc.gov/nip/events/niiw/default.htm

10th Annual Conference on Vaccine Research
April 30 – May 2, 2007
Baltimore Marriott Waterfront Hotel,
Baltimore, MD
www.nfid.org/conferences/vaccine07

National Rural Health Association (NRHA)
May 15–18, 2007
William Egan Civic and Convention Center,
Anchorage, AK
www.nrharural.org/conferences/sub/AnnConf.html

52nd Annual Meeting and Exhibit of the American College of Nurse-Midwives (ACNM)
May 25–31, 2007
Sheraton Chicago Hotel and Towers, Chicago, IL
240-485-1800, www.midwife.org

Global Health Council's 34th Annual International Conference
May 29 – June 1, 2007
Washington, DC
www.globalhealth.org/conference

National Vaccine Advisory Committee (NVAC) Meeting
June 7–8, 2007
Washington, D.C.
Call Emma English at 202-260-1253
www.hhs.gov/nvpo/nvac

Options for the Control of Influenza VI Meeting
June 17–23, 2007
Ontario, Canada
www.optionsviconference.com

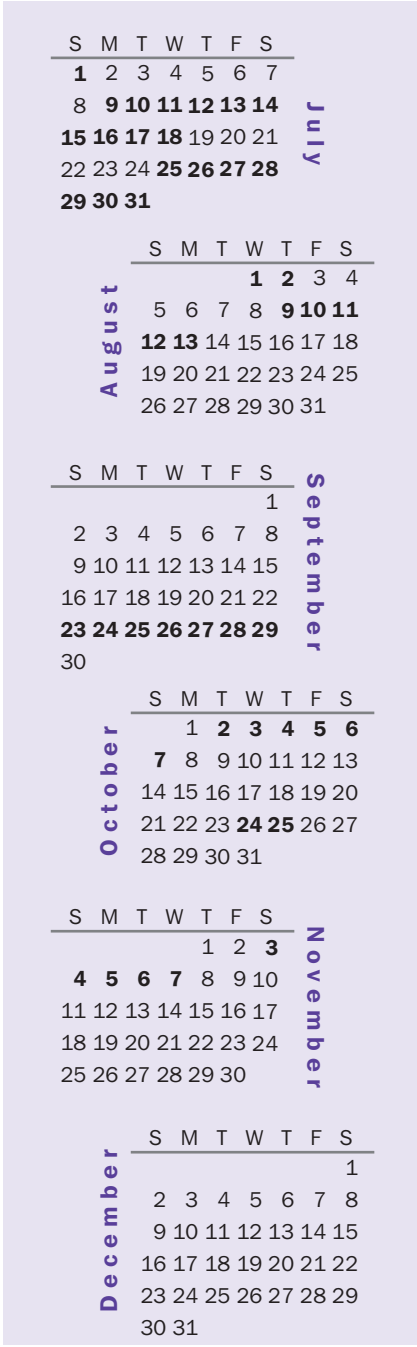
Advisory Committee on Immunization Practices
June 27–28, 2007
Atlanta, GA
www.cdc.gov/nip/ACIP/

39th Annual National Association of School Nurses (NASN) Conference
June 28 – July 1, 2007
Gaylord's Opryland Hotel, Nashville, TN
www.nasn.org/Default.aspx?tabid=109

81st Annual ASHA School Health Conference—Health Literacy in Many Cultures
July 9–13, 2007
Honolulu, HI
www.ashaweb.org/annual_conferences.html

National Association of County and City Health Officials (NACCHO)
July 11–13, 2007
Hyatt Regency Columbus, Columbus, OH
www.naccho.org/

26th Annual Meeting of the American Society for Virology
July 14–18, 2007
Oregon State University, Corvallis, OR
http://oregonstate.edu/conferences/asv2007/



35th Annual National Black Nurses Association (NBNA) Institute and Conference
July 25–29, 2007
Hyatt Regency Hotel, Atlanta, GA
www.nbna.org/conferences/conf07/conf07.htm

2007 Joint Statistical Meetings—Statistics: Harnessing the Power of Information
July 29 – August 2, 2007
Salt Place Convention Center, Salt Lake City, UT
www.amstat.org/meetings/jsm/2007/index.cfm

CDC Influenza Vaccination Campaign and National Influenza Vaccination Week
September 2007 – February 2008
www.cdc.gov/flu/

National Adult Immunization Awareness Week
September 23–29, 2007
Nationwide
www.cdc.gov/nip/events/naiaw/default.htm

National Vaccine Advisory Committee (NVAC) Meeting
October 2–3, 2007
Washington, D.C.
Call Emma English at 202-260-1253
www.hhs.gov/nvpo/nvac

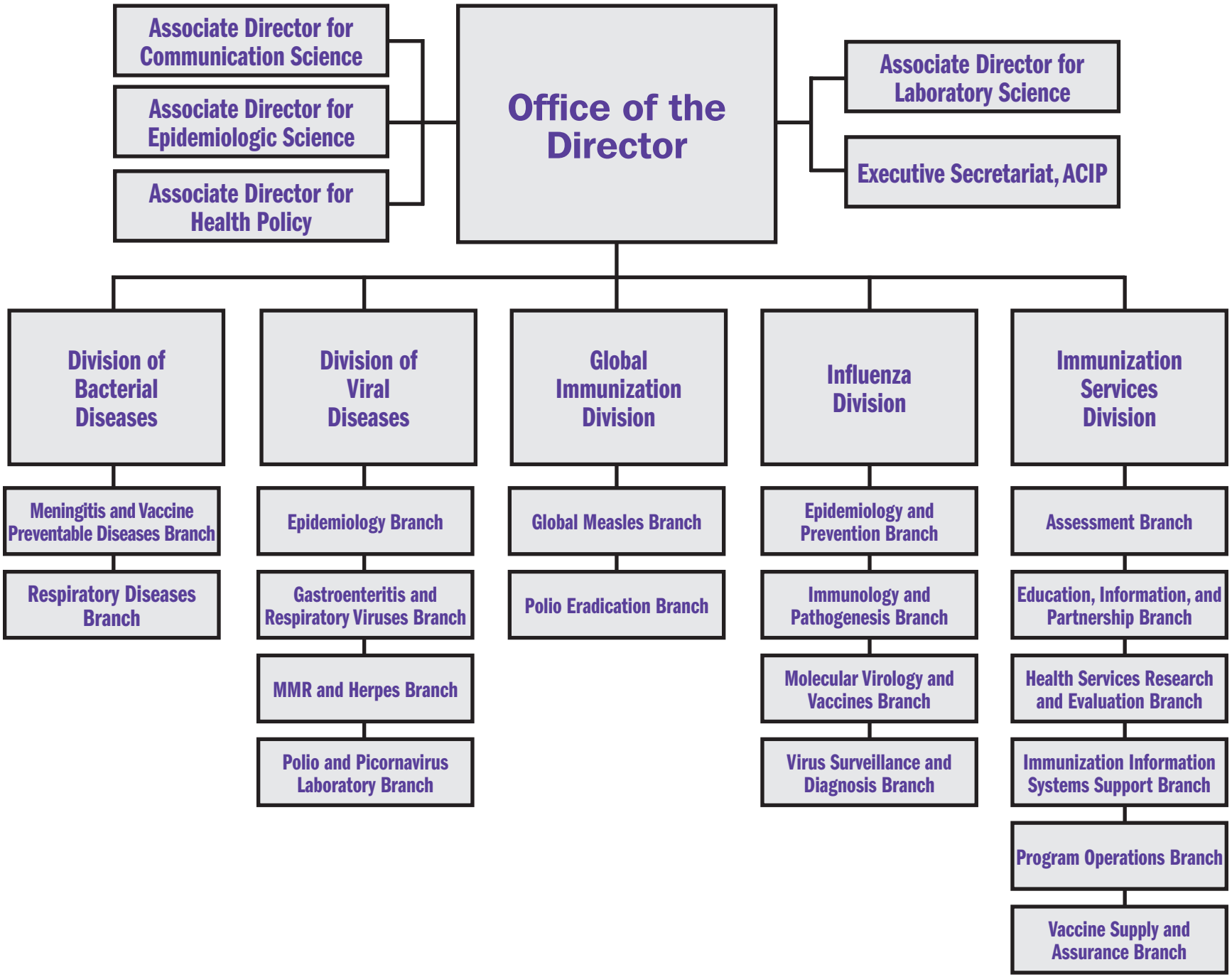
Association of State and Territorial Health Officials (ASTHO)—2007 Annual Meeting
October 2–5, 2007
St. Louis, MO
www.astho.org

45th Annual Infection Disease Society of American Meeting
October 4–7, 2007
San Diego, CA
www.idsociety.org/

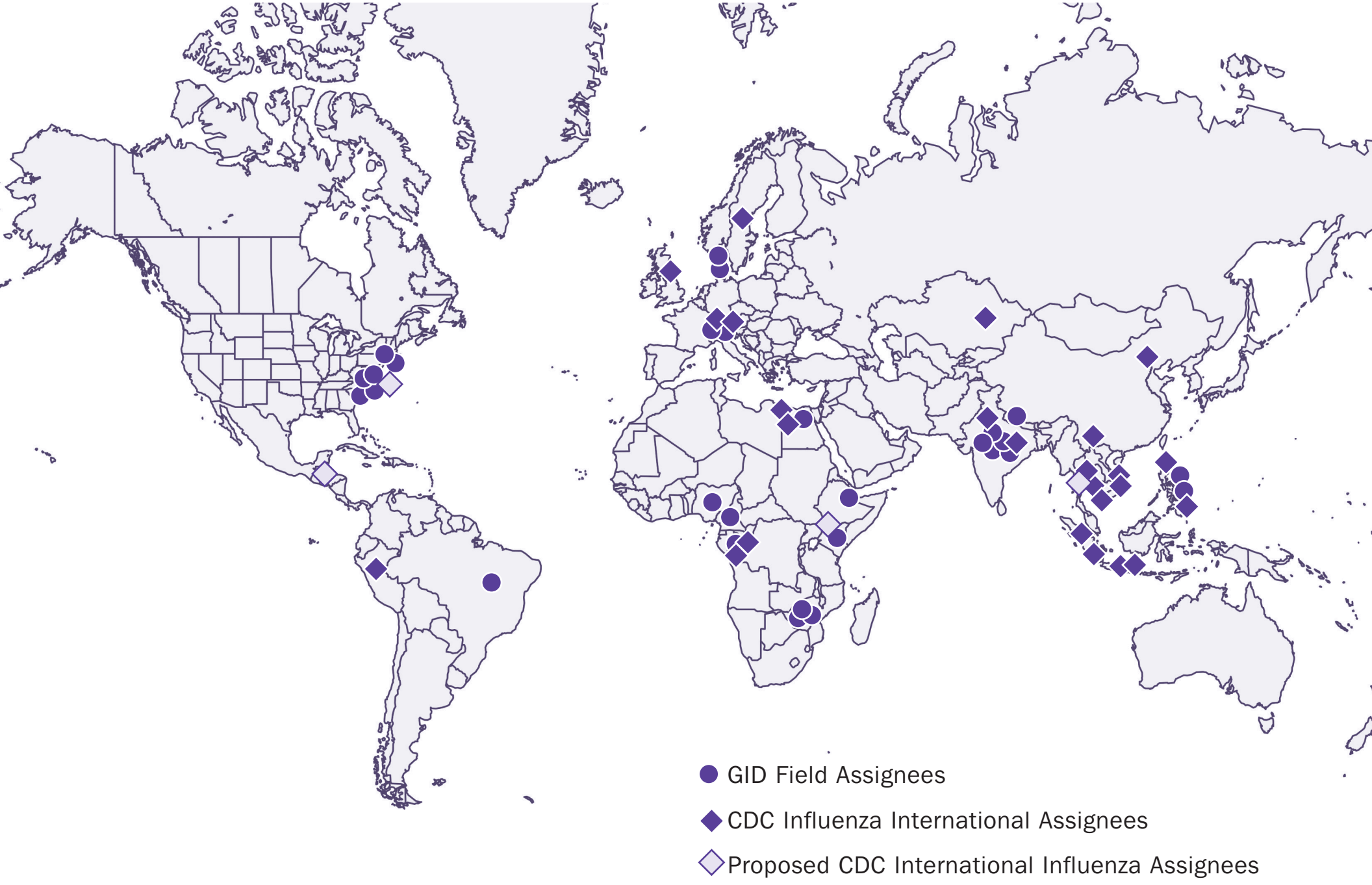
Advisory Committee on Immunization Practices (ACIP)
October 24–25, 2007
Atlanta, GA
www.cdc.gov/nip/ACIP/

135th Annual American Public Health Association Meeting—Politics, Policy and Public Health
November 3–7, 2007
Washington, DC
www.apha.org/meetings/

NCIRD organization

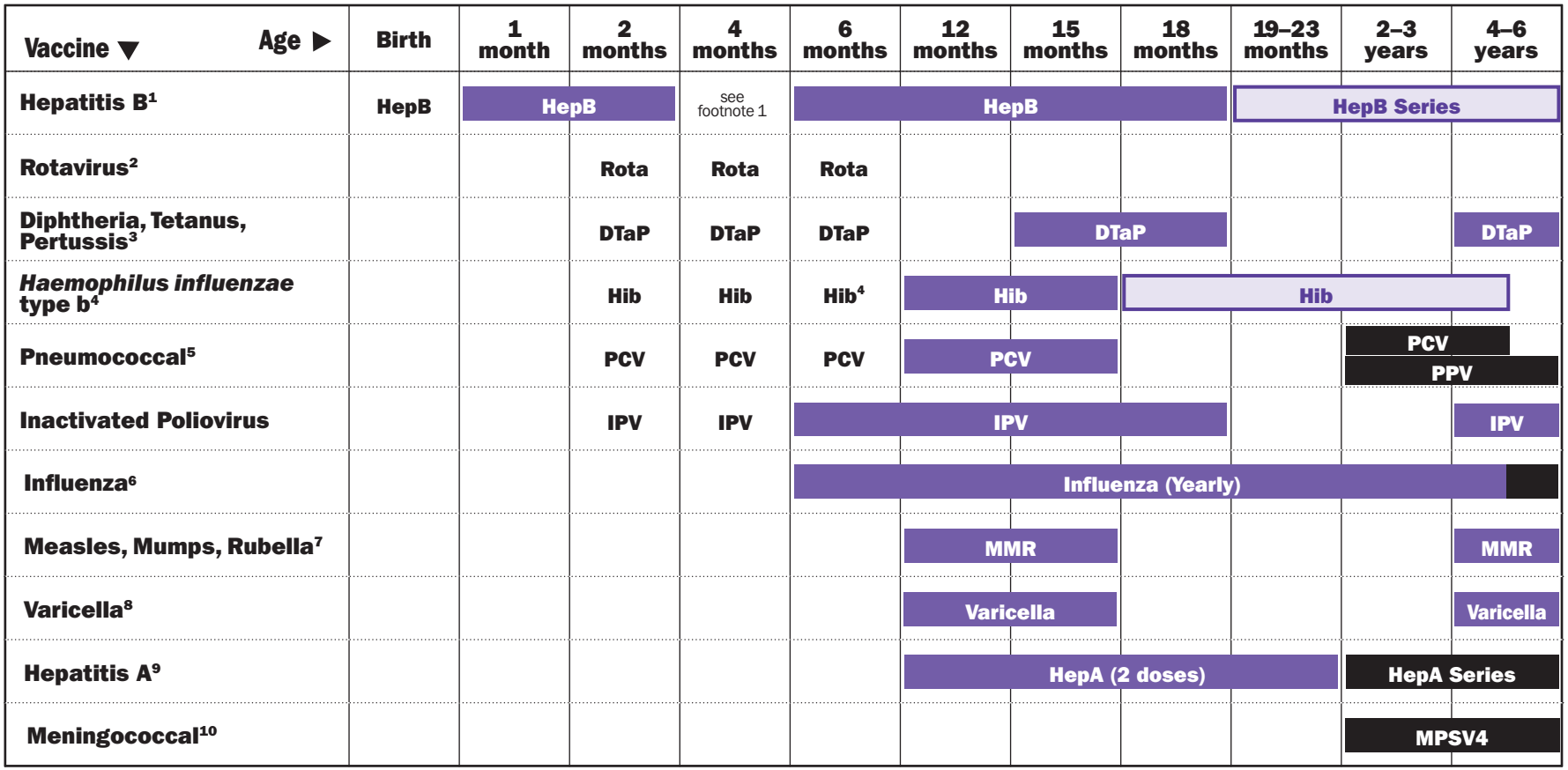


NCIRD international field staff 2006



Immunization *Schedules*

Recommended Immunization Schedule for Persons Aged 0–6 Years **United States · 2007**



Range of recommended ages

Catch-up immunization

Certain high-risk groups

The Recommended Immunization Schedules for Persons Aged 0–18 Years are approved by the Advisory Committee on Immunization Practices (www.cdc.gov/nip/acip), the American Academy of Pediatrics (www.aap.org), and the American Academy of Family Physicians (www.aafp.org).

This schedule indicates the recommended ages for routine administration of currently licensed childhood vaccines, as of December 1, 2006, for children aged 0–6 years. Additional information is available at www.cdc.gov/nip/recs/child-schedule.htm. Any dose not administered at the recommended age should be administered at any subsequent visit, when indicated and feasible. Additional vaccines may be licensed and recommended during the year. Licensed combination vaccines may be used whenever any components of the combination are indicated and other components of the vaccine are not contraindicated and if approved by the Food and Drug Administration for that dose of the series. Providers should consult the respective Advisory Committee on Immunization Practices statement for detailed recommendations. Clinically significant adverse events that follow immunization should be reported to the Vaccine Adverse Event Reporting System (VAERS). Guidance about how to obtain and complete a VAERS form is available at www.vaers, hhs.gov or by telephone, 800-822-7967.

Recommended Immunization Schedule for Persons Aged 7–18 Years **United States · 2007**

Vaccine ▼ / Age ▶	7–10 years	11–12 years	13–14 years	15 years	16–18 years
Tetanus, Diphtheria, Pertussis[1]	see footnote 1	Tdap	Tdap		
Human Papillomavirus[2]	see footnote 2	HPV (3 doses)	HPV Series		
Meningococcal[3]	MPSV4	MCV4	MCV4	MCV4[3]	
Pneumococcal[4]	PPV				
Influenza[5]	Influenza (Yearly)				
Hepatitis A[6]	HepA Series				
Hepatitis B[7]	HepB Series				
Inactivated Poliovirus[8]	IPV Series				
Measles, Mumps, Rubella[9]	MMR Series				
Varicella[10]	Varicella Series				

Range of recommended ages Catch-up immunization Certain high-risk groups

The Recommended Immunization Schedules for Persons Aged 0–18 Years are approved by the Advisory Committee on Immunization Practices (www.cdc.gov/nip/acip), the American Academy of Pediatrics (www.aap.org), and the American Academy of Family Physicians (www.aafp.org).

This schedule indicates the recommended ages for routine administration of currently licensed childhood vaccines, as of December 1, 2006, for children aged 7–18 years. Additional information is available at www.cdc.gov/nip/recs/child-schedule.htm. Any dose not administered at the recommended age should be administered at any subsequent visit, when indicated and feasible. Additional vaccines may be licensed and recommended during the year. Licensed combination vaccines may be used whenever any components of the combination are indicated and other components of the vaccine are not contraindicated and if approved by the Food and Drug Administration for that dose of the series. Providers should consult the respective Advisory Committee on Immunization Practices statement for detailed recommendations. Clinically significant adverse events that follow immunization should be reported to the Vaccine Adverse Event Reporting System (VAERS). Guidance about how to obtain and complete a VAERS form is available at http://www.vaers.hhs.gov or by telephone, 800-822-7967.

Catch-up Immunization Schedule for Persons Aged 4 Months – 18 Years Who Start Late or Who Are More Than 1 Month Behind

United States · 2007

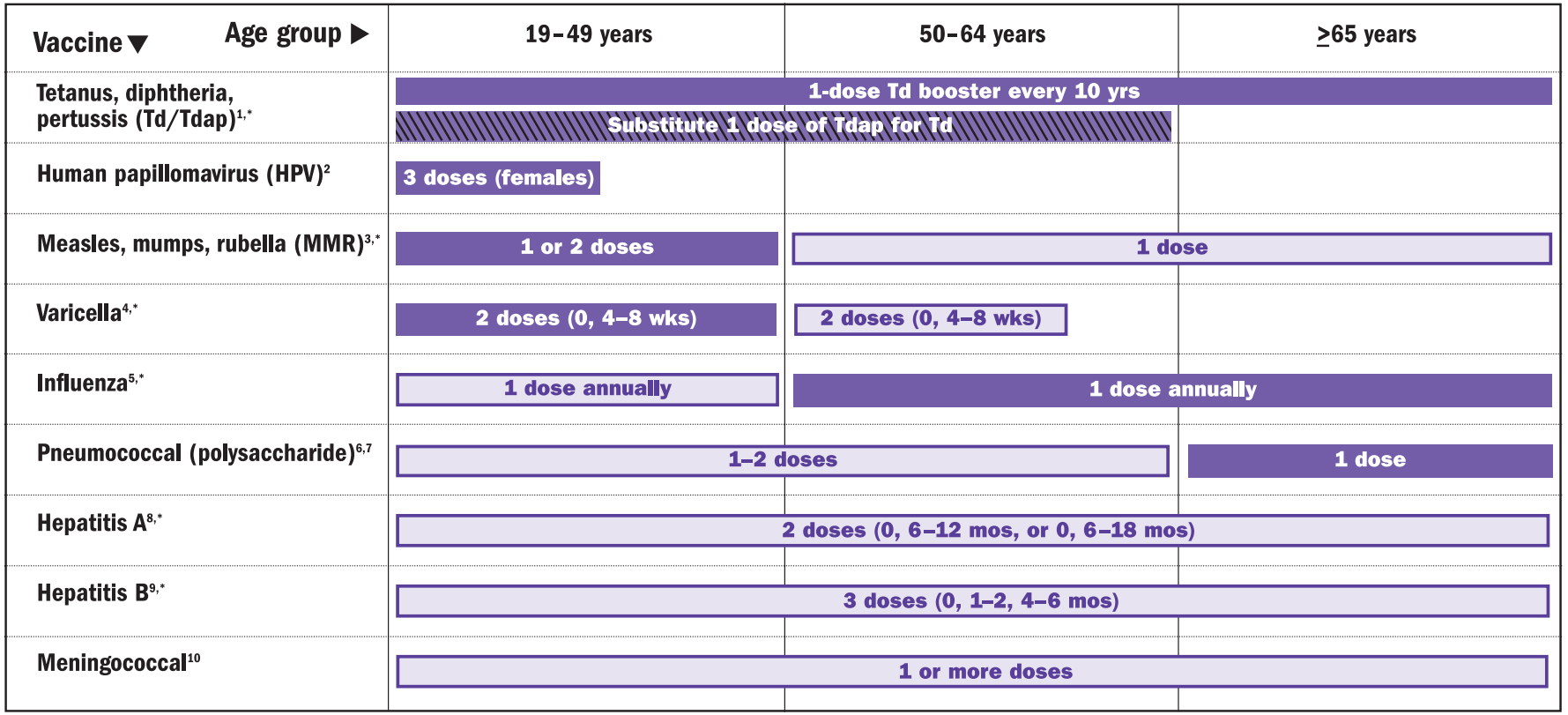
The table below provides catch-up schedules and minimum intervals between doses for children whose vaccinations have been delayed. A vaccine series does not need to be restarted, regardless of the time that has elapsed between doses. Use the section appropriate for the child's age.

CATCH-UP SCHEDULE FOR PERSONS AGED 4 MONTHS – 6 YEARS					
Vaccine	**Minimum Age for Dose 1**	**Minimum Interval Between Doses**			
		Dose 1 to Dose 2	**Dose 2 to Dose 3**	**Dose 3 to Dose 4**	**Dose 4 to Dose 5**
Hepatitis B[1]	Birth	4 weeks	8 weeks (and 16 weeks after first dose)		
Rotavirus[2]	6 wks	4 weeks	4 weeks		
Diphtheria, Tetanus, Pertussis[3]	6 wks	4 weeks	4 weeks	6 months	6 months[3]
Haemophilus influenzae type b[4]	6 wks	4 weeks if first dose administered at age <12 months 8 weeks (as final dose) if first dose administered at age 12–14 months No further doses needed if first dose administered at age ≥15 months	4 weeks[4] if current age <12 months 8 weeks (as final dose)[4] if current age ≥12 months and second dose administered at age <15 months No further doses needed if previous dose administered at age ≥15 months	8 weeks (as final dose) This dose only necessary for children aged 12 months–5 years who received 3 doses before age 12 months	
Pneumococcal[5]	6 wks	4 weeks if first dose administered at age <12 months and current age <24 months 8 weeks (as final dose) if first dose administered at age ≥12 months or current age 24–59 months No further doses needed for healthy children if first dose administered at age ≥24 months	4 weeks if current age <12 months 8 weeks (as final dose) if current age ≥12 months No further doses needed for healthy children if previous dose administered at age ≥24 months	8 weeks (as final dose) This dose only necessary for children aged 12 months–5 years who received 3 doses before age 12 months	
Inactivated Poliovirus[6]	6 wks	4 weeks	4 weeks	4 weeks[6]	
Measles,Mumps, Rubella[7]	12 mos	4 weeks			
Varicella[8]	12 mos	3 months			
Hepatitis A[9]	12 mos	6 months			
CATCH-UP SCHEDULE FOR PERSONS AGED 7–18 YEARS					
Tetanus,Diphtheria/ Tetanus,Diphtheria, Pertussis[10]	7 yrs[10]	4 weeks	8 weeks if first dose administered at age <12 months 6 months if first dose administered at age ≥12 months	6 months if first dose administered at age <12 months	
Human Papillomavirus[11]	9 yrs	4 weeks	12 weeks		
Hepatitis A[9]	12 mos	6 months			
Hepatitis B[1]	Birth	4 weeks	8 weeks (and 16 weeks after first dose)		
Inactivated Poliovirus[6]	6 wks	4 weeks	4 weeks	4 weeks[6]	
Measles, Mumps, Rubella[7]	12 mos	4 weeks			
Varicella[8]	12 mos	4 weeks if first dose administered at age ≥13 years 3 months if first dose administered at age <13 years			

Information about reporting reactions after immunization is available online at www.vaers.hhs.gov or by telephone via the 24-hour national toll-free information line 800-822-7967. Suspected cases of vaccine-preventable diseases should be reported to the state or local health department. Additional information, including precautions and contraindications for immunization, is available from the National Center for Immunization and Respiratory Diseases at www.cdc.gov/nip/default.htm or telephone, 800-CDC-INFO (800-232-4636).

Recommended Adult Immunization Schedule, by Vaccine and Age Group

United States · October 2006 – September 2007



*Covered by the Vaccine Injury Compensation Program. NOTE: These recommendations must be read with the footnotes.

For all persons in this category who meet the age requirements and who lack evidence of immunity (e.g., lack documentation of vaccination or have no evidence of prior infection)

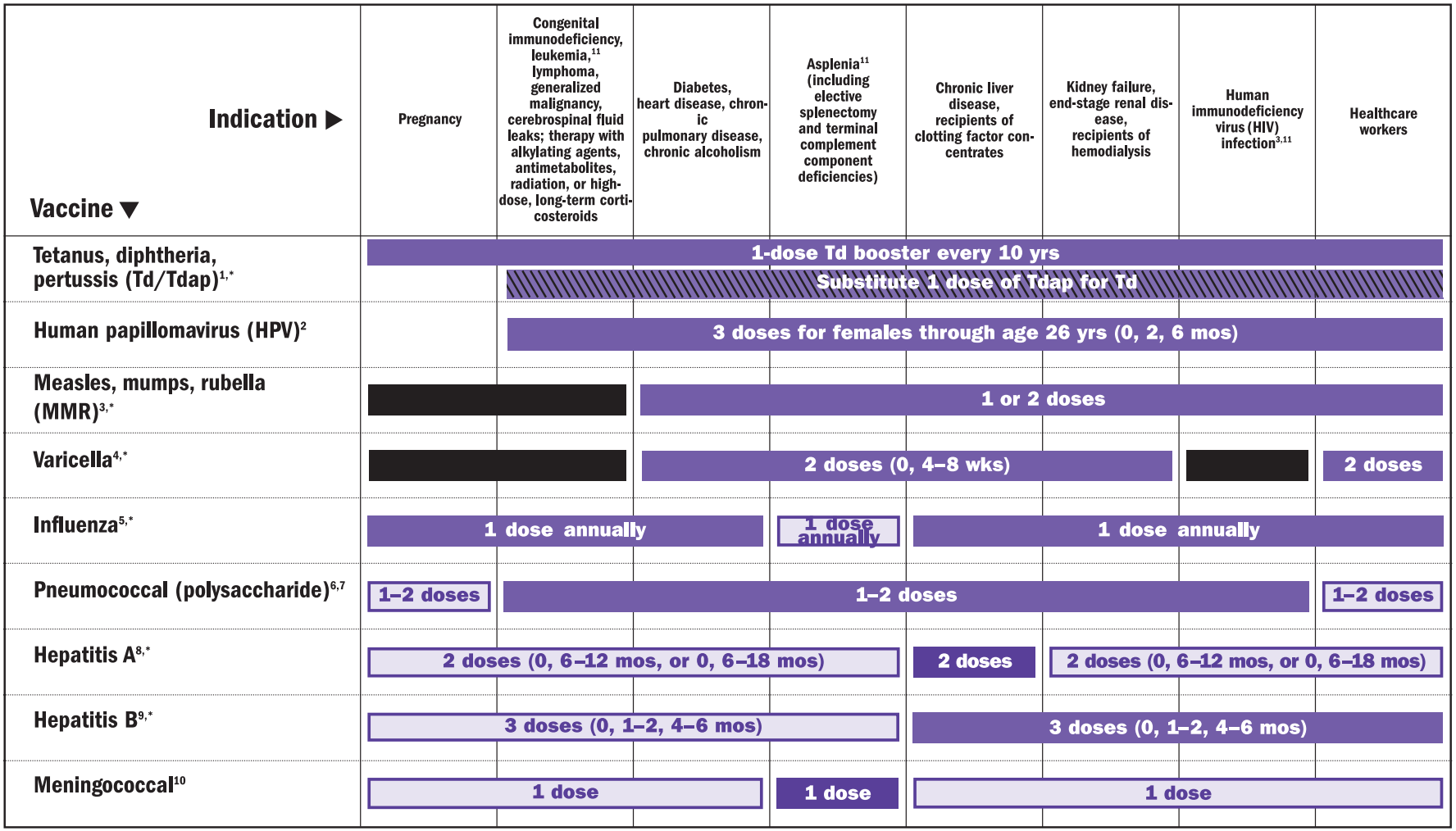
Recommended if some other risk factor is present (e.g., on the basis of medical, occupational, lifestyle, or other indications)

This schedule indicates the recommended age groups and medical indications for routine administration of currently licensed vaccines for persons aged ≥19 years, as of October 1, 2006. Licensed combination vaccines may be used whenever any components of the combination are indicated and when the vaccine's other components are not contraindicated. For detailed recommendations on all vaccines, including those used primarily for travelers or that are issued during the year, consult the manufacturers' package inserts and the complete statements from the Advisory Committee on Immunization Practices (www.cdc.gov/nip/publications/acip-list.htm).

Report all clinically significant postvaccination reactions to the Vaccine Adverse Event Reporting System (VAERS). Reporting forms and instructions on filing a VAERS report are available at www.vaers.hhs.gov or by telephone, 800-822-7967. Information on how to file a Vaccine Injury Compensation Program claim is available at www.hrsa.gov/vaccinecompensation or by telephone, 800-338-2382. To file a claim for vaccine injury, contact the U.S. Court of Federal Claims, 717 Madison Place, N.W., Washington, D.C. 20005; telephone, 202-357-6400. Additional information about the vaccines in this schedule and contraindications for vaccination is also available at www.cdc.gov/nip or from the CDC-INFO Contact Center at 800-CDC-INFO (800-232-4636) in English and Spanish, 24 hours a day, 7 days a week.

Recommended Adult Immunization Schedule, by Vaccine and Medical and Other Indications

United States · October 2006 – September 2007



*Covered by the Vaccine Injury Compensation Program. NOTE: These recommendations must be read with the footnotes.

For all persons in this category who meet the age requirements and who lack evidence of immunity (e.g., lack documentation of vaccination or have no evidence of prior infection)

Recommended if some other risk factor is present (e.g., on the basis of medical, occupational, lifestyle, or other indications)

Contraindicated

Approved by
the Advisory Committee on Immunization Practices,
the American College of Obstetricians and Gynecologists,
the American Academy of Family Physicians,
and the American College of Physicians

Footnotes

to immunization schedules

Persons Aged 0–6 Years

1. Hepatitis B vaccine (HepB). *(Minimum age: birth)*

At birth:

- Administer monovalent HepB to all newborns before hospital discharge.
- If mother is hepatitis surface antigen (HBsAg)-positive, administer HepB and 0.5 mL of hepatitis B immune globulin (HBIG) within 12 hours of birth.
- If mother's HBsAg status is unknown, administer HepB within 12 hours of birth. Determine the HBsAg status as soon as possible and if HBsAg-positive, administer HBIG (no later than age 1 week).
- If mother is HBsAg-negative, the birth dose can only be delayed with physician's order and mother's negative HBsAg laboratory report documented in the infant's medical record.

After the birth dose:

- The HepB series should be completed with either monovalent HepB or a combination vaccine containing HepB. The second dose should be administered at age 1–2 months. The final dose should be administered at age ≥24 weeks. Infants born to HBsAg-positive mothers should be tested for HBsAg and antibody to HBsAg after completion of ≥3 doses of a licensed HepB series, at age 9–18 months (generally at the next well-child visit).

4-month dose:

- It is permissible to administer 4 doses of HepB when combination vaccines are administered after the birth dose. If monovalent HepB is used for doses after the birth dose, a dose at age 4 months is not needed.

2. Rotavirus vaccine (Rota). *(Minimum age: 6 weeks)*

- Administer the first dose at age 6–12 weeks. Do not start the series later than age 12 weeks.
- Administer the final dose in the series by age 32 weeks. Do not administer a dose later than age 32 weeks.
- Data on safety and efficacy outside of these age ranges are insufficient.

3. Diphtheria and tetanus toxoids and acellular pertussis vaccine (DTaP). *(Minimum age: 6 weeks)*

- The fourth dose of DTaP may be administered as early as age 12 months, provided 6 months have elapsed since the third dose.
- Administer the final dose in the series at age 4–6 years.

4. *Haemophilus influenzae* type b conjugate vaccine (Hib). *(Minimum age: 6 weeks)*

- If PRP-OMP (PedvaxHIB® or ComVax® [Merck]) is administered at ages 2 and 4 months, a dose at age 6 months is not required.
- TriHiBit® (DTaP/Hib) combination products should not be used for primary immunization but can be used as boosters following any Hib vaccine in children aged ≥12 months.

5. Pneumococcal vaccine. *(Minimum age: 6 weeks for pneumococcal conjugate vaccine [PCV]; 2 years for pneumococcal polysaccharide vaccine [PPV])*

- Administer PCV at ages 24–59 months in certain high-risk groups. Administer PPV to children aged ≥2 years in certain high-risk groups. See *MMWR* 2000;49(No. RR-9):1–35.

6. Influenza vaccine. *(Minimum age: 6 months for trivalent inactivated influenza vaccine [TIV]; 5 years for live, attenuated influenza vaccine [LAIV])*

- All children aged 6–59 months and close contacts of all children aged 0–59 months are recommended to receive influenza vaccine.
- Influenza vaccine is recommended annually for children aged ≥59 months with certain risk factors, health-care workers, and other persons (including household members) in close contact with persons in groups at high risk. See *MMWR* 2006;55(No. RR-10):1–41.
- For healthy persons aged 5–49 years, LAIV may be used as an alternative to TIV.
- Children receiving TIV should receive 0.25 mL if aged 6–35 months or 0.5 mL if aged ≥3 years.
- Children aged <9 years who are receiving influenza vaccine for the first time should receive 2 doses (separated by ≥4 weeks for TIV and ≥6 weeks for LAIV).

7. Measles, mumps, and rubella vaccine (MMR). *(Minimum age: 12 months)*

- Administer the second dose of MMR at age 4–6 years. MMR may be administered before age 4–6 years, provided ≥4 weeks have elapsed since the first dose and both doses are administered at age ≥12 months.

8. Varicella vaccine. *(Minimum age: 12 months)*

- Administer the second dose of varicella vaccine at age 4–6 years. Varicella vaccine may be administered before age 4–6 years, provided that ≥3 months have elapsed since the first dose and both doses are administered at age ≥12 months. If second dose was administered ≥28 days following the first dose, the second dose does not need to be repeated.

9. Hepatitis A vaccine (HepA). *(Minimum age: 12 months)*

- HepA is recommended for all children aged 1 year (*i.e.*, aged 12–23 months). The 2 doses in the series should be administered at least 6 months apart.
- Children not fully vaccinated by age 2 years can be vaccinated at subsequent visits.
- HepA is recommended for certain other groups of children, including in areas where vaccination programs target older children. See *MMWR* 2006;55(No. RR-7):1–23.

10. Meningococcal polysaccharide vaccine (MPSV4). *(Minimum age: 2 years)*

- Administer MPSV4 to children aged 2–10 years with terminal complement deficiencies or anatomic or functional asplenia and certain other high-risk groups. See *MMWR* 2005;54(No. RR-7):1–21.

Persons Aged 7–18

1. Tetanus and diphtheria toxoids and acellular pertussis vaccine (Tdap). *(Minimum age: 10 years for BOOSTRIX® and 11 years for ADACEL™)*

- Administer at age 11–12 years for those who have completed the recommended childhood DTP/DTaP vaccination series and have not received a tetanus and diphtheria toxoids vaccine (Td) booster dose.
- Adolescents aged 13–18 years who missed the 11–12 year Td/Tdap booster dose should also receive a single dose of Tdap if they have completed the recommended childhood DTP/DTaP vaccination series.

2. Human papillomavirus vaccine (HPV). *(Minimum age: 9 years)*

- Administer the first dose of the HPV vaccine series to females at age 11–12 years.
- Administer the second dose 2 months after the first dose and the third dose 6 months after the first dose.
- Administer the HPV vaccine series to females at age 13–18 years if not previously vaccinated.

3. Meningococcal vaccine. *(Minimum age: 11 years for meningococcal conjugate vaccine [MCV4]; 2 years for meningococcal polysaccharide vaccine [MPSV4])*

- Administer MCV4 at age 11–12 years and to previously unvaccinated adolescents at high school entry (at approximately age 15 years).
- Administer MCV4 to previously unvaccinated college freshmen living in dormitories; MPSV4 is an acceptable alternative.
- Vaccination against invasive meningococcal disease is recommended for children and adolescents aged ≥2 years with terminal complement deficiencies or anatomic or functional asplenia and certain other high-risk groups. See MMWR 2005;54(No. RR-7):1–21. Use MPSV4 for children aged 2–10 years and MCV4 or MPSV4 for older children.

4. Pneumococcal polysaccharide vaccine (PPV). *(Minimum age: 2 years)*

- Administer for certain high-risk groups. See *MMWR* 1997;46(No. RR-8):1–24, and *MMWR* 2000;49(No. RR-9):1–35.

5. Influenza vaccine. *(Minimum age: 6 months for trivalent inactivated influenza vaccine [TIV]; 5 years for live, attenuated influenza vaccine [LAIV])*

- Influenza vaccine is recommended annually for persons with certain risk factors, health-care workers, and other persons (including household members) in close contact with persons in groups at high risk. See *MMWR* 2006;55 (No. RR-10):1–41.
- For healthy persons aged 5–49 years, LAIV may be used as an alternative to TIV.
- Children aged <9 years who are receiving influenza vaccine for the first time should receive 2 doses (separated by ≥4 weeks for TIV and ≥6 weeks for LAIV).

6. Hepatitis A vaccine (HepA). *(Minimum age: 12 months)*

- The 2 doses in the series should be administered at least 6 months apart.
- HepA is recommended for certain other groups of children, including in areas where vaccination programs target older children. See MMWR 2006;55 (No. RR-7):1–23.

7. Hepatitis B vaccine (HepB). *(Minimum age: birth)*

- Administer the 3-dose series to those who were not previously vaccinated.
- A 2-dose series of Recombivax HB® is licensed for children aged 11–15 years.

8. Inactivated poliovirus vaccine (IPV). *(Minimum age: 6 weeks)*

- For children who received an all-IPV or all-oral poliovirus (OPV) series, a fourth dose is not necessary if the third dose was administered at age ≥4 years.
- If both OPV and IPV were administered as part of a series, a total of 4 doses should be administered, regardless of the child's current age.

9. Measles, mumps, and rubella vaccine (MMR). *(Minimum age: 12 months)*

- If not previously vaccinated, administer 2 doses of MMR during any visit, with ≥4 weeks between the doses.

10. Varicella vaccine. *(Minimum age: 12 months)*

- Administer 2 doses of varicella vaccine to persons without evidence of immunity.
- Administer 2 doses of varicella vaccine to persons aged <13 years at least 3 months apart. Do not repeat the second dose, if administered ≥28 days after the first dose.
- Administer 2 doses of varicella vaccine to persons aged ≥13 years at least 4 weeks apart.

Catch-up

1. Hepatitis B vaccine (HepB). *(Minimum age: birth)*

- Administer the 3-dose series to those who were not previously vaccinated.
- A 2-dose series of Recombivax HB® is licensed for children aged 11–15 years.

2. Rotavirus vaccine (Rota). *(Minimum age: 6 weeks)*

- Do not start the series later than age 12 weeks.
- Administer the final dose in the series by age 32 weeks. Do not administer a dose later than age 32 weeks.
- Data on safety and efficacy outside of these age ranges are insufficient.

3. Diphtheria and tetanus toxoids and acellular pertussis vaccine (DTaP). *(Minimum age: 6 weeks)*

- The fifth dose is not necessary if the fourth dose was administered at age ≥4 years.
- DTaP is not indicated for persons aged ≥7 years.

4. *Haemophilus influenzae* type b conjugate vaccine (Hib). (Minimum age: 6 weeks)

- Vaccine is not generally recommended for children aged ≥5 years.
- If current age <12 months and the first 2 doses were PRP-OMP (PedvaxHIB® or ComVax® [Merck]), the third (and final) dose should be administered at age 12– 15 months and at least 8 weeks after the second dose.
- If first dose was administered at age 7–11 months, administer 2 doses separated by 4 weeks plus a booster at age 12–15 months.

5. Pneumococcal conjugate vaccine (PCV). *(Minimum age: 6 weeks)*

- Vaccine is not generally recommended for children aged ≥5 years.

6. Inactivated poliovirus vaccine (IPV). *(Minimum age: 6 weeks)*

- For children who received an all-IPV or all-oral poliovirus (OPV) series, a fourth dose is not necessary if third dose was administered at age ≥4 years.
- If both OPV and IPV were administered as part of a series, a total of 4 doses should be administered, regardless of the child's current age.

7. Measles, mumps, and rubella vaccine (MMR). *(Minimum age: 12 months)*

- The second dose of MMR is recommended routinely at age 4–6 years but may be administered earlier if desired.
- If not previously vaccinated, administer 2 doses of MMR during any visit with ≥4 weeks between the doses.

8. Varicella vaccine. *(Minimum age: 12 months)*
- The second dose of varicella vaccine is recommended routinely at age 4–6 years but may be administered earlier if desired.
- Do not repeat the second dose in persons aged <13 years if administered ≥28 days after the first dose.

9. Hepatitis A vaccine (HepA). *(Minimum age: 12 months)*
- HepA is recommended for certain groups of children, including in areas where vaccination programs target older children. See MMWR 2006;55(No. RR-7):1–23.

10. Tetanus and diphtheria toxoids vaccine (Td) and tetanus and diphtheria toxoids and acellular pertussis vaccine (Tdap).
(Minimum ages: 7 years for Td, 10 years for BOOSTRIX®, and 11 years for ADACEL™)
- Tdap should be substituted for a single dose of Td in the primary catch-up series or as a booster if age appropriate; use Td for other doses.
- A 5-year interval from the last Td dose is encouraged when Tdap is used as a booster dose. A booster (fourth) dose is needed if any of the previous doses were administered at age <12 months. Refer to ACIP recommendations for further information. See *MMWR* 2006;55(No. RR-3).

11. Human papillomavirus vaccine (HPV). *(Minimum age: 9 years)*
- Administer the HPV vaccine series to females at age 13–18 years if not previously vaccinated.

Adult

1. Tetanus, diphtheria, and acellular pertussis (Td/Tdap) vaccination. Adults with uncertain histories of a complete primary vaccination series with diphtheria and tetanus toxoid-containing vaccines should begin or complete a primary vaccination series. A primary series for adults is 3 doses; administer the first 2 doses at least 4 weeks apart and the third dose 6–12 months after the second. Administer a booster dose to adults who have completed a primary series and if the last vaccination was received ≥10 years previously. Tdap or tetanus and diphtheria (Td) vaccine may be used; Tdap should replace a single dose of Td for adults aged <65 years who have not previously received a dose of Tdap (either in the primary series, as a booster, or for wound management). Only one of two Tdap products (Adacel® [sanofi pasteur]) is licensed for use in adults. If the person is pregnant and received the last Td vaccination ≥10 years previously, administer Td during the second or third trimester; if the person received the last Td vaccination in <10 years, administer Tdap during the immediate postpartum period. A one-time administration of 1 dose of Tdap with an interval as short as 2 years from a previous Td vaccination is recommended for postpartum women, close contacts of infants aged <12 months, and all healthcare workers with direct patient contact. In certain situations, Td can be deferred during pregnancy and Tdap substituted in the immediate postpartum period, or Tdap can be given instead of Td to a pregnant woman after an informed discussion with the woman (see www.cdc.gov/nip/publications/acip-list.htm). Consult the ACIP statement for recommendations for administering Td as prophylaxis in wound management (www.cdc.gov/mmwr/preview/mmwrhtml/00041645.htm).

2. Human papillomavirus (HPV) vaccination. HPV vaccination is recommended for all women aged ≤26 years who have not completed the vaccine series. Ideally, vaccine should be administered before potential exposure to HPV through sexual activity; however, women who are sexually active should still be vaccinated. Sexually active women who have not been infected with any of the HPV vaccine types receive the full benefit of the vaccination. Vaccination is less beneficial for women who have already been infected with one or more of the four HPV vaccine types. A complete series consists of 3 doses. The second dose should be administered 2 months after the first dose; the third dose should be administered 6 months after the first dose. Vaccination is not recommended during pregnancy. If a woman is found to be pregnant after initiating the vaccination series, the remainder of the 3-dose regimen should be delayed until after completion of the pregnancy.

3. Measles, mumps, rubella (MMR) vaccination. Measles component: adults born before 1957 can be considered immune to measles. Adults born during or after 1957 should receive ≥1 dose of MMR unless they have a medical contraindication, documentation of ≥1 dose, history of measles based on healthcare provider diagnosis, or laboratory evidence of immunity. A second dose of MMR is recommended for adults who 1) have been recently exposed to measles or in an outbreak setting; 2) have been previously vaccinated with killed measles vaccine; 3) have been vaccinated with an unknown type of measles vaccine during 1963–1967; 4) are students in postsecondary educational institutions; 5) work in ahealthcare facility; or 6) plan to travel internationally. Withhold MMR or other measles-containing vaccines from HIV-infected persons with severe immunosuppression. *Mumps component:* adults born before 1957 can generally be considered immune to mumps. Adults born during or after 1957 should receive 1 dose of MMR unless they have a medical contraindication, history of mumps based on healthcare provider diagnosis, or laboratory evidence of immunity. A second dose of MMR is recommended for adults who 1) are in an age group that is affected during a mumps outbreak; 2) are students in postsecondary educational institutions; 3) work in a healthcare facility; or 4) plan to travel internationally. For unvaccinated healthcare workers born before 1957 who do not have other evidence of mumps immunity, consider giving 1 dose on a routine basis and strongly consider giving a second dose during an outbreak. *Rubella component:* administer 1 dose of MMR vaccine to women whose rubella vaccination history is unreliable or who lack laboratory evidence of immunity. For women of childbearing age, regardless of birth year, routinely determine rubella immunity and counsel women regarding congenital rubella syndrome. Do not vaccinate women who are pregnant or who might become pregnant within 4 weeks of receiving vaccine. Women who do not have evidence of immunity should receive MMR vaccine upon completion or termination of pregnancy and before discharge from the healthcare facility.

4. Varicella vaccination. All adults without evidence of immunity to varicella should receive 2 doses of varicella vaccine. Special consideration should be given to those who 1) have close contact with persons at high risk for severe disease (*e.g.*, healthcare workers and family contacts of immunocompromised persons) or 2) are at high risk for exposure or transmission (*e.g.*, teachers of young children; child care employees; residents and staff members of institutional settings, including correctional institutions; college students; military personnel; adolescents and adults living in households with children; nonpregnant women of childbearing age; and international travelers). Evidence of immunity to varicella in adults includes any of the following: 1) documentation of 2 doses of varicella vaccine at least 4 weeks apart; 2) U.S.-born before 1980 (although for healthcare workers and pregnant women, birth before 1980 should not be considered evidence of immunity); 3) history of varicella based on diagnosis or verification of varicella by a healthcare provider (for a patient reporting a history of or presenting with an atypical case, a mild case, or both, healthcare providers should seek either an epidemiologic link with a typical varicella case or evidence of laboratory confirmation, if it was performed at the time of acute disease); 4) history of herpes zoster based on healthcare provider diagnosis; or 5) laboratory evidence of immunity or laboratory confirmation of disease. Do not vaccinate women who are pregnant or might become pregnant within 4 weeks of receiving the vaccine. Assess pregnant women for evidence of varicella immunity. Women who do not have evidence of immunity should receive dose 1 of varicella vaccine upon completion or termination of pregnancy and before discharge from the healthcare facility. Dose 2 should be administered 4–8 weeks after dose 1.

5. Influenza vaccination. *Medical indications:* chronic disorders of the cardiovascular or pulmonary systems, including asthma; chronic metabolic diseases, including diabetes mellitus, renal dysfunction, hemoglobinopathies, or immunosuppression (including immunosuppression caused by medications or HIV); any condition that compromises respiratory function or the handling of respiratory secretions or that can increase the risk of aspiration (*e.g.*, cognitive dysfunction, spinal cord injury, or seizure disorder or other neuromuscular disorder); and pregnancy during the influenza season. No data exist on the risk for severe or complicated influenza disease among persons with asplenia; however, influenza is a risk factor for secondary bacterial infections that can cause severe disease among persons with asplenia. *Occupational indications:* healthcare workers and employees of long-term–care and assisted living facilities. *Other indications:* residents of nursing homes and other long-term–care and assisted living facilities; persons likely to transmit influenza to persons at high risk (*e.g.*, in-home household contacts and caregivers of children aged 0–59 months, or persons of all ages with high-risk conditions); and anyone who would like to be vaccinated. Healthy, nonpregnant persons aged 5–49 years without high-risk medical conditions who are not contacts of severely immunocompromised persons in special care units can receive either intranasally administered influenza vaccine (FluMist®) or inactivated vaccine. Other persons should receive the inactivated vaccine.

6. Pneumococcal polysaccharide vaccination. *Medical indications:* chronic disorders of the pulmonary system (excluding asthma); cardiovascular diseases; diabetes mellitus; chronic liver diseases, including liver disease as a result of alcohol abuse (*e.g.*, cirrhosis); chronic renal failure or nephrotic syndrome; functional or anatomic asplenia (*e.g.*, sickle cell disease or splenectomy [if elective splenectomy is planned, vaccinate at least 2 weeks before surgery]); immunosuppressive conditions (*e.g.*, congenital immunodeficiency, HIV infection [vaccinate as close to diagnosis as possible when CD4 cell counts are highest], leukemia, lymphoma, multiple myeloma, Hodgkin disease, generalized malignancy, or organ or bone marrow transplantation); chemotherapy with alkylating agents, antimetabolites, or high-dose, long-term corticosteroids; and cochlear implants. *Other indications:* Alaska Natives and certain American Indian populations and residents of nursing homes or other long-term–care facilities.

7. Revaccination with pneumococcal polysaccharide vaccine. One-time revaccination after 5 years for persons with chronic renal failure or nephrotic syndrome; functional or anatomic asplenia (*e.g.*, sickle cell disease or splenectomy); immunosuppressive conditions (*e.g.*, congenital immunodeficiency, HIV infection, leukemia, lymphoma, multiple myeloma, Hodgkin disease, generalized malignancy, or organ or bone marrow transplantation); or chemotherapy with alkylating agents, antimetabolites, or high-dose, long-term corticosteroids. For persons aged ≥65 years, one-time revaccination if they were vaccinated ≥5 years previously and were aged <65 years at the time of primary vaccination.

8. Hepatitis A vaccination. *Medical indications:* persons with chronic liver disease and persons who receive clotting factor concentrates. *Behavioral indications:* men who have sex with men and persons who use illegal drugs. *Occupational indications:* persons working with hepatitis A virus (HAV)–infected primates or with HAV in a research laboratory setting. *Other indications:* persons traveling to or working in countries that have high or intermediate endemicity of hepatitis A (a list of countries is available at www.cdc.gov/travel/diseases.htm) and any person who would like to obtain immunity. Current vaccines should be administered in a 2-dose schedule at either 0 and 6–12 months, or 0 and 6–18 months. If the combined hepatitis A and hepatitis B vaccine is used, administer 3 doses at 0, 1, and 6 months.

9. Hepatitis B vaccination. *Medical indications:* persons with end-stage renal disease, including patients receiving hemodialysis; persons seeking evaluation or treatment for a sexually transmitted disease (STD); persons with HIV infection; persons with chronic liver disease; and persons who receive clotting factor concentrates. *Occupational indications:* healthcare workers and public-safety workers who are exposed to blood or other potentially infectious body fluids. *Behavioral indications:* sexually active persons who are not in a long-term, mutually monogamous relationship (*i.e.*, persons with >1 sex partner during the previous 6 months); current or recent injection-drug users; and men who have sex with men. *Other indications:* household contacts and sex partners of persons with chronic hepatitis B virus (HBV) infection; clients and staff members of institutions for persons with developmental disabilities; all clients of STD clinics; international travelers to countries with high or intermediate prevalence of chronic HBV infection (a list of countries is available at www.cdc.gov/travel/diseases.htm); and any adult seeking protection from HBV infection. Settings where hepatitis B vaccination is recommended for all adults: STD treatment facilities; HIV testing and treatment facilities; facilities providing drug-abuse treatment and prevention services; healthcare settings providing services for injection-drug users or men who have sex with men; correctional facilities; end-stage renal disease programs and facilities for chronic hemodialysis patients; and institutions and nonresidential daycare facilities for persons with developmental disabilities. *Special formulation indications:* for adult patients receiving hemodialysis and other immunocompromised adults, 1 dose of 40 µg/mL (Recombivax HB®) or 2 doses of 20 µg/mL (Engerix-B®).

10. Meningococcal vaccination. *Medical indications:* adults with anatomic or functional asplenia, or terminal complement component deficiencies. *Other indications:* first-year college students living in dormitories; microbiologists who are routinely exposed to isolates of *Neisseria meningitidis*; military recruits; and persons who travel to or live in countries in which meningococcal disease is hyperendemic or epidemic (*e.g.*, the "meningitis belt" of sub-Saharan Africa during the dry season [December–June]), particularly if their contact with local populations will be prolonged. Vaccination is required by the government of Saudi Arabia for all travelers to Mecca during the annual Hajj. Meningococcal conjugate vaccine is preferred for adults with any of the preceding indications who are aged ≤55 years, although meningococcal polysaccharide vaccine (MPSV4) is an acceptable alternative. Revaccination after 5 years might be indicated for adults previously vaccinated with MPSV4 who remain at high risk for infection (*e.g.*, persons residing in areas in which disease is epidemic).

11. Selected conditions for which *Haemophilus influenzae* type b (Hib) vaccine may be used. Hib conjugate vaccines are licensed for children aged 6 weeks–71 months. No efficacy data are available on which to base a recommendation concerning use of Hib vaccine for older children and adults with the chronic conditions associated with an increased risk for Hib disease. However, studies suggest good immunogenicity in patients who have sickle cell disease, leukemia, or HIV infection or who have had splenectomies; administering vaccine to these patients is not contraindicated.

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NCIRD resources
for public health professionals

Phone numbers / E-mail

Phone

CDC Contact Center—CDC-INFO:
800-CDC-INFO (232-4636)
TTY—888-232-6348
In English, En Español—24/7

NIP INFO: 1-800-232-4636

E-mail

NIPINFO@cdc.gov
For CDC inquiries: www.cdc.gov/netinfo.htm/

TRAVELLEGIONELLA@cdc.gov
To report travel-associated Legionnaires' disease cases

Websites

CDC home page: www.cdc.gov

Immunization website: www.cdc.gov/nip

ACIP meeting dates:
www.cdc.gov/nip/ACIP/dates.htm

School and Childcare Vaccination survey results:
www.cdc.gov/nip/coverage/schoolsurv/overview.htm

Get Smart: Know When Antibiotics Work:
www.cdc.gov/getsmart

Active Bacterial Core surveillance (ABCs):
www.cdc.gov/abcs

Group B strep home page and resources:
www.cdc.gov/groupbstrep

Streptococcal laboratory:
www.cdc.gov/ncidod/biotech/strep/strepindex.htm

Legionnaires' disease home page and resources: www.cdc.gov/legionella

Materials available online

Flu gallery:
www.cdc.gov/flu/professionals/flugallery/index.htm

Vaccine Storage and Handling Toolkit:
www2a.cdc.gov/nip/isd/shtoolkit/splash.html

Vaccine-related publications:
www.cdc.gov/nip/publications

User's Guide for Vaccine Contracts:
www.cdc.gov/nip/policies/guide-vac-contracts-508.pdf

School and Childcare Vaccination survey results:
www.cdc.gov/nip/coverage/schoolsurv/overview.htm

New first-of-its-kind vaccine to prevent cervical cancer licensed in 2006…

Healthy People in Every Stage of Life

No country is ever truly free of polio until all countries are free of polio…

Healthy People in a Healthy World

Samples collected from the potable water system of the new building revealed the presence of the same strain of Legionella *bacteria as the patients…*

Healthy People in Healthy Places

Influenza H5N1 is being watched very closely for its potential to begin a human influenza pandemic…

People Prepared for Emerging Health Threats